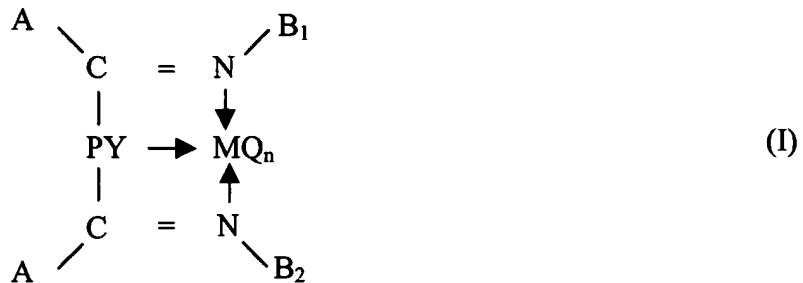


CLAIMS

1. An ethylene polymerization process comprising:
 - (a) providing a transition metal catalyst component characterized by the formula:



(i) wherein M is a transition metal selected from Groups 4-11 of the Periodic Table of Elements;

(ii) n is an integer of from 1 – 3;
(iii) Q is a halogen or a C₁ – C₂ alkyl group;
(iv) PY is a pyridinyl group, which is coordinated with M through the nitrogen atom of said pyridinyl group;

(v) A is a methyl group, a phenyl group, or a substituted phenyl group;
wherein:

1. said catalyst component has C₂ symmetry and B₁ and B₂ are the same and are a 1-naphthyl group, a substituted 1-naphthyl group, a 5,6,7,8-tetrahydro-1-naphthyl group or an anthracenyl group; or

2. said catalyst component exhibits C_{2v} symmetry and B₁ and B₂ are the same and are a phenyl group or a substituted phenyl group; or

3. said catalyst exhibits Cs symmetry and B₁ is a phenyl or substituted phenyl group and B₂ is different from B₁ and is a polyphenyl group or terphenyl group,

(b) providing an activating co-catalyst component;

(c) contacting said catalyst component and said co-catalyst component with ethylene in a polymerization reaction zone which is free of hydrogen or contains hydrogen in an amount which is less than 5 mol% of said ethylene under polymerization conditions to produce a polymer product by the polymerization of said ethylene; and

(d) recovering said polymer product from said reaction zone.

2. The process of claim 1 wherein said polymer product is an ethylene homopolymer.

3. The process of claim 1 wherein said catalyst component and said co-catalyst component are contacted in said polymerization reaction zone with ethylene and a C₃₊ alpha olefin to produce a copolymer of ethylene and said C₃₊ alpha olefin.

4. The process of claim 3 wherein said C₃₊ alpha olefin is propylene.

5. The process of claim 1 wherein said catalyst component comprises a mixture of two catalyst subcomponents, one of which exhibits C₂, C_{2v} or Cs symmetry and the other of which exhibits C₂, C_{2v} or Cs symmetry which is different from the symmetry of said first catalyst subcomponent.

6. The process of claim 1 wherein said catalyst component exhibits C₂ symmetry and produces a polymer of lower molecular weight than the polymer produced by a

corresponding catalyst component of C₂ symmetry in which the substituents A are of a higher molecular weight than the substituents A of said catalyst component or in which the groups B₁ and B₂ are less aromatic than the groups B₁ and B₂ of said catalyst component.

7. The process of claim 1 wherein said catalyst component exhibits Cs symmetry and produces a polymer of higher molecular weight than the polymer produced by a corresponding catalyst component of Cs symmetry in which at least one of the groups B₁ and B₂ is less bulky than corresponding group B₁ or B₂ of said catalyst component.

8. The process of claim 1 wherein said catalyst component exhibits C_{2v} symmetry and produces a polymer of higher molecular weight than the polymer produced by a corresponding catalyst component of C_{2v} symmetry in which the substituents A are of a lower molecular weight than the substituents A of said catalyst component.

9. The process of claim 1 wherein said catalyst component exhibits C₂ symmetry and the polymer product has a lower molecular weight than the polymer product produced by polymerization under the same polymerization conditions with a catalyst component having Cs or C_{2v} symmetry.

10. The process of claim 1 wherein said catalyst component exhibits Cs symmetry and the polymer produced by the polymerization of said monomer in said reaction zone has a molecular weight which is greater than the molecular weight of the polymer product produced by polymerization under the same polymerization conditions with a catalyst component having C₂ symmetry.

11. The process of claim 1 wherein said catalyst component exhibits C₂v symmetry and said polymerization reaction zone is operated under conditions to produce a polymer product having a molecular weight greater than that produced by operation of the reaction zone under corresponding conditions with a catalyst having C_s symmetry.

12. The process of claim 1 wherein hydrogen is introduced into said reaction zone in an amount effective to increase the activity of said catalyst component relative to the activity of said catalyst component without the introduction of hydrogen.

13. The process of claim 11 wherein said hydrogen is introduced in an amount to provide a hydrogen/ethylene mole ratio within the range of 0.001 – 0.02.

14. The process of claims 1 wherein 1-hexene is introduced into said reaction zone in an amount effective to decrease the molecular weight of said polymer product relative to the polymer product produced by the polymerization of said ethylene in the absence of hexene.

15. The process of claim 1 wherein hydrogen and hexene are introduced into said polymerization reaction zone along with said ethylene.

16. The process of claim 1 wherein M is a transition metal selected from Groups 8-10 of the Periodic Table of Elements.

17. The process of claim 16 wherein M is iron or cobalt and n is 2.

18. The process of claim 17 wherein M is iron.

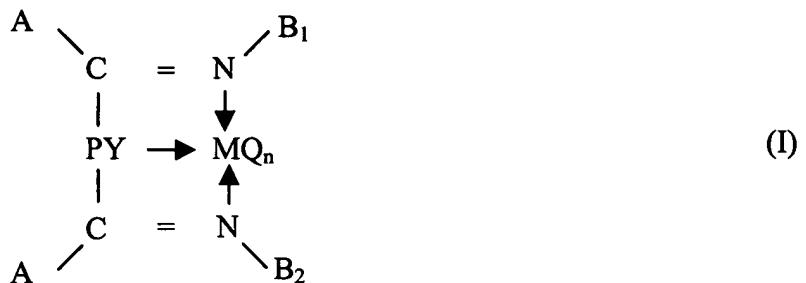
19. The process of claim 18 wherein Q is chlorine or bromine.

20. The process of claim 19 wherein Q is chlorine.

21. The process of claim 20 wherein the activating co-catalyst is an alkylalumoxane.

22. An ethylene polymerization process comprising:

(a) providing a first transition metal catalyst component characterized by the formula:



(i) wherein M is a transition metal selected from Groups 4-11 of the Periodic Table of Elements;

(ii) n is an integer of from 1 - 3;

(iii) Q is a halogen or a C₁ - C₂ alkyl group;

(iv) PY is a pyridinyl group, which is coordinated with M through the nitrogen atom of said pyridinyl group;

(v) A is a methyl group, a phenyl group, or a substituted phenyl group;

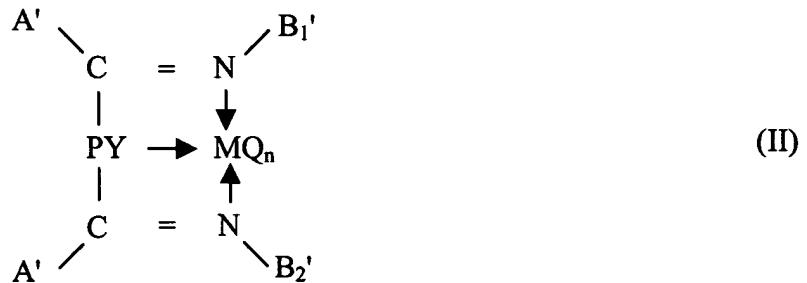
wherein:

1. said first catalyst component has C₂ symmetry and B₁ and B₂ are the same and are a 1-naphthyl group, a substituted 1-naphthyl group, a 5,6,7,8-tetrahydro-1-naphthyl group or an anthracenyl group; or

2. said first catalyst component exhibits C_{2v} symmetry and B₁ and B₂ are the same and are a phenyl group or a substituted phenyl group; or

3. said first catalyst exhibits Cs symmetry and B_1 is a phenyl or substituted phenyl group and B_2 is different from B_1 and is a polyphenyl group or terphenyl group,

- (b) providing a first activating co-catalyst component;
- (c) contacting said catalyst component and said co-catalyst component with ethylene in a polymerization reaction zone under polymerization conditions to produce a first polymer product by the polymerization of said ethylene;
- (d) recovering said first polymer product from said reaction zone;
- (e) providing a second transition metal catalyst component which is different than said first transition metal catalyst component and is characterized by the formula:



- (i) wherein M is a transition metal selected from Groups 4-11 of the Periodic Table of Elements;
 - (ii) n is an integer of from 1 – 3;
 - (iii) Q is a halogen or a $C_1 - C_2$ alkyl group;
 - (iv) PY is a pyridinyl group, which is coordinated with M through the nitrogen atom of said pyridinyl group;
 - (v) A' is a methyl group, a phenyl group, or a substituted phenyl group;

wherein:

1. said second catalyst component has C₂ symmetry and B₁'

and B₂' are the same and are a 1-naphthyl group, a substituted 1-naphthyl group, a 5,6,7,8-tetrahydro-1-naphthyl group or an anthracenyl group; or

2. said second catalyst component exhibits C_{2v} symmetry and

B₁' and B₂' are the same and are a phenyl group or a substituted phenyl group; or

3. said second catalyst component exhibits Cs symmetry and

B₁' is a phenyl or substituted phenyl group and B₂' is different from B₁' and is a polyphenyl group or terphenyl group;

(f) providing a second activating co-catalyst component which may be the same as or different from said first co-catalyst component;

(g) contacting said second catalyst component and said second co-catalyst component with ethylene in a polymerization reaction zone under polymerization conditions to produce a second polymer product by the polymerization of said ethylene, said second polymer product having a different molecular weight characteristic than said first polymer product; and

(h) recovering said second polymer product from said reaction zone.

23. The process of claim 22 wherein said first catalyst component has C₂ symmetry and said second catalyst component has Cs or C_{2v} symmetry to produce said second polymer which has a higher molecular weight than said first polymer product.

24. The process of claim 22 wherein said first catalyst component has C₂ or Cs symmetry and said second catalyst component has C_{2v} symmetry to produce said second polymer product which has a higher molecular weight than said first polymer product.

25. The process of claim 22 wherein said first and second catalyst components each have C2 symmetry and wherein the substituent A' of said second catalyst component is bulkier than the substituent A of said first catalyst component to produce a second polymer product which has a lower molecular weight than the molecular weight of said first polymer product.

26. The process of claim 22 wherein said first catalyst component and said second catalyst component each have C2 symmetry and said group B₁' and B₂' of said second catalyst component has a lower aromaticity than the groups B₁ and B₂ to produce a second polymer having a lower molecular weight than the molecular weight of said first polymer product.

27. The process of claim 22 wherein said first and second catalyst components each have C2v symmetry and the substituent A' of said second catalyst component is bulkier than the substituent A of said first catalyst component to produce a second polymer product which has a higher molecular weight than the molecular weight of said first polymer product.

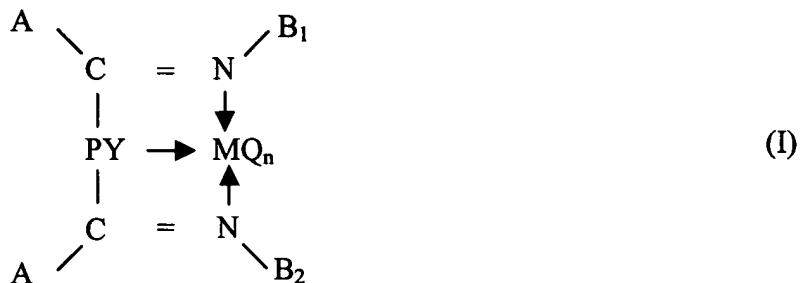
28. The process of claim 22 wherein said first catalyst component and said second catalyst component each have Cs symmetry and said group B₁' of said second catalyst component has a bulk which is greater than the group B₁ of said first catalyst component to produce a second polymer product which has a higher molecular weight than the molecular weight of said first polymer product.

29. The process of claim 22 wherein said first catalyst component and said second catalyst component each have Cs symmetry and said group B₂' of said second catalyst component has a bulk which is greater than the group B₂ of said first catalyst component to

produce a second polymer product which has a higher molecular weight than the molecular weight of said first polymer product.

30. An ethylene polymerization process comprising:

(a) providing a first transition metal catalyst component characterized by the formula:



(i) wherein M is a transition metal selected from Groups 4-11 of the Periodic Table of Elements;

(ii) n is an integer of from 1 - 3;

(iii) Q is a halogen or a C₁ - C₂ alkyl group;

(iv) PY is a pyridinyl group, which is coordinated with M through the nitrogen atom of said pyridinyl group;

(v) A is a methyl group, a phenyl group, or a substituted phenyl group;

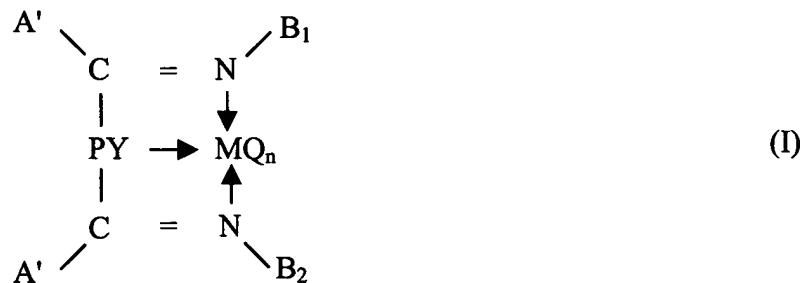
wherein:

1. said first catalyst component has C₂ symmetry and B₁ and B₂ are the same and are a 1-naphthyl group, a substituted 1-naphthyl group, a 5,6,7,8-tetrahydro-1-naphthyl group or an anthracenyl group; or

2. said first catalyst component exhibits C_{2v} symmetry and B₁ and B₂ are the same and are a phenyl group or a substituted phenyl group; or

3. said first catalyst exhibits Cs symmetry and B₁ is a phenyl or substituted phenyl group and B₂ is different from B₁ and is a polyphenyl group or terphenyl group,

- (b) providing a first activating co-catalyst component;
- (c) contacting said catalyst component and said co-catalyst component with ethylene in a polymerization reaction zone under polymerization conditions to produce a first polymer product by the polymerization of said ethylene;
- (d) recovering said first polymer product from said reaction zone;
- (e) providing a second transition metal catalyst component which is different than said first transition metal catalyst component and is characterized by the formula:



- (i) wherein M is a transition metal selected from Groups 4-11 of the Periodic Table of Elements;
- (ii) n is an integer of from 1 – 3;
- (iii) Q is a halogen or a C₁ – C₂ alkyl group;
- (iv) PY is a pyridinyl group, which is coordinated with M through the nitrogen atom of said pyridinyl group;
- (v) A' is a methyl group, a phenyl group, or a substituted phenyl group;

wherein:

1. said second catalyst component has C₂ symmetry and B₁' and B₂' are the same and are a 1-naphthyl group, a substituted 1-naphthyl group, a 5,6,7,8-tetrahydro-1-naphthyl group or an anthracenyl group; or

2. said second catalyst component exhibits C_{2v} symmetry and B₁' and B₂' are the same and are a phenyl group or a substituted phenyl group; or

3. said second catalyst component exhibits Cs symmetry and B₁' is a phenyl or substituted phenyl group and B₂' is different from B₁' and is a polyphenyl group or terphenyl group, provided that said second catalyst component exhibits a different symmetry than said first catalyst component;

(f) providing an activating co-catalyst component;

(g) introducing ethylene, said first and second catalyst components, and at least one activating co-catalyst component into a polymerization reaction zone and operating said reaction zone under polymerization conditions to produce a polymer product by the polymerization of said ethylene; and

(h) recovering said second polymer product from said reaction zone.

31. The process of claim 30 wherein said first and second catalyst components are introduced into said polymerization reaction zone in a mixture of said first and second catalyst components.

32. The process of claim 30 wherein said first and second catalyst components are introduced into said polymerization reaction zone sequentially to produce two different polymer products.

33. A polymer product produced by the process of claim 1.

34. The polymer product of claim 32 comprising an ethylene homopolymer or an ethylene alphaolefin copolymer.

35. An article of manufacture formed from the polymer product of claim 34 where said product is a product produced by injection molding, a product produced by blow molding, or a product produced by extrusion.

36. The article of claim 35 comprising a film produced by extrusion molding.